

CLAIMS

1. A DNA sequence selected from the group consisting of the DNA inserts of Z-pBR322(Pst)/HcIF-4c, Z-pBR322(Pst)/HcIF-2h, Z-pBR322(Pst)/HcIF-SN35, Z-pBR322(Pst)/
5 HcIF-SN42, Z-pKT287(Pst)/HcIF-2h-AH6, DNA sequences which hybridize to any of the foregoing DNA inserts, DNA sequences, from whatever source obtained, including natural, synthetic or semi-synthetic sources, related by mutation, including
10 single or multiple, base substitutions, deletions, insertions and inversions to any of the foregoing DNA sequences or inserts, and DNA sequences comprising sequences of codons which on expression code for a polypeptide displaying similar immunological or biological activity to a polypeptide coded for on expression of the codons of any of the
15 foregoing DNA sequences and inserts.

2. A DNA sequence according to claim 1 wherein said DNA sequence which hybridizes to said DNA insert is selected from the group consisting of the DNA inserts of Z-pBR322(Pst)/HcIF-II-206 or Z-pBR322 (Pst)/HcIF-SN35-AHL6,
20 DNA sequences which hybridize to any of the foregoing DNA inserts, DNA sequences, from whatever source obtained, including natural, synthetic or semi-synthetic sources, related by mutation, including single or multiple, base substitutions, deletions, insertions and inversions to
25 any of the foregoing DNA sequences or inserts, and DNA sequences comprising sequences of codons which on expression code for a polypeptide displaying similar immunological or biological activity to a polypeptide coded for on expression of the codons of any of the foregoing DNA
30 sequences and inserts.

3. A DNA sequence according to claim 1 wherein said DNA sequence which hybridizes to said DNA insert is selected from the group consisting of Hif-chr1, Hif-chr3, Hif-chr12, Hif-chr13, Hif-chr16-2, Hif-chr26,
35 Hif-chr30, Hif-chr35, DNA sequences which hybridize to any of the foregoing DNA sequences, DNA sequences, from

whatever source obtained, including natural, synthetic, or semi-synthetic sources, related by mutation, including single or multiple, base substitutions, deletions, insertions and inversions, to any of the foregoing DNA sequences and
5 DNA sequences comprising sequences of codons which on expression code for a polypeptide similar in immunological or biological activity to a polypeptide coded for on expression of any of the foregoing DNA sequences.

4. A DNA sequence according to claim 1
10 wherein said DNA sequence which hybridizes to said DNA insert is selected from the group consisting of Hif-chr19, Hif-chr27, DNA sequences which hybridize to any of the foregoing DNA sequences, DNA sequences, from whatever source obtained, including natural, synthetic, or semi-
15 synthetic sources, related by mutation, including single or multiple, base substitutions, deletions, insertions and inversions, to any of the foregoing DNA sequences and DNA sequences comprising sequences of codons which on expression code for a polypeptide similar in immunological
20 or biological activity to a polypeptide coded for on expression of any of the foregoing DNA sequences.

5. A DNA sequence selected from the group consisting of DNA sequences of the formula: ATGGCCTCGCCC
TTTGCTTTACTGATGGTCCTGGTGGTGCTCAGCTGCAAGTCAAGCTGCTCTCTGGGC
25 TGTGATCTCCCTGAGACCCAGCCTGGATAACAGGAGGACCTTGATGCTCCTGGCA
CAAATGAGCAGAATCTCTCTTCTCCTCTGTCTGATGGACAGACATGACTTTGGATTT
CCCCAGGAGGAGTTTGATGGCAACCAGTTCCAGAAGGCTCCAGCCATCTCTGTCTC
CATGAGCTGATCCAGCAGATCTTCAACCTCTTTACCACAAAAGATTCTGCTGCT
TGGGATGAGGACCTCTAGACAAATTCTGCACCGAACTCTACCAGCAGCTGAATGAC
30 TTGGAAGCCTGTGTGATGCAGGAGGAGAGGGTGGGAGAACTCCCTGATGAATGCG
GACTCCATCTTGGCTGTGAAGAAATACTTCCGAAGAATCACTCTCTATCTGACAGAG
AAGAAATACAGCCCTTGTGCCTGGGAGGTTGTCAGAGCAGAAATCATGAGATCCTCT
CTTTATCAACAACTTGCAAGAAAGATTAAAGGAGGAAGGAATAA, TGTGATCTCCC
TGAGACCCACAGCCTGGATAACAGGAGGACCTTGATGCTCCTGGCACAAATGAGCAG
35 AATCTCTCCTTCTCCTCTGTCTGATGGACAGACATGACTTTGGATTTCCCCAGGAGGA
GTTTGATGGCAACCAGTTCCAGAAGGCTCCAGCCATCTCTGTCTCCATGAGCTGAT
CCAGCAGATCTTCAACCTCTTTACCACAAAAGATTCTGCTGCTTGGGATGAGGA

CCTCCTAGACAAATTCTGCACCGAACTCTACCAGCAGCTGAATGACTTGGAAGCCTG
TGTGATGCAGGAGGAGAGGGTGGGAGAACTCCCCTGATGAATGCGGACTCCATCTT
GGCTGTGAAGAAATACTTCCGAAGAATCACTCTCTATCTGACAGAGAAGAAATACAG
CCCTTGTGCCTGGGAGGTTGTCAGAGCAGAAATCATGAGATCCCTCTCTTTATCAAC

- 5 AAACCTTGCAAGAAAGATTAAAGGAGGAAGGAATAA and fragments and
derivatives thereof, said fragments and derivatives
coding for polypeptides displaying an immunological or
biological activity of IFN- α .

6. A DNA sequence selected from the group
10 consisting of DNA sequences of the formula: TTAAGTGGTGGCC
CTCCTGGTGGCTCAGCTGCAAGTCAAGCTGCTCTGTGGGCTGTGATCTGCCTCAAACC
CACAGCCTGGGTAGCAGGAGGACCTTGATGCTCCTGGCACAGATGAGGAGAATCTCT
CTTTTCTCCTGCTTGAAGGACAGACATGACTTTGGATTTCCTCCAGGAGGAGTTTGGC
AACCAGTTCCAAAAGGCTGAAACCATCCCTGTCCTCCATGAGATGATCCAGCAGATC
15 TTCAATCTCTTCAGCACAAAGGACTCATCTGCTGCTTGGGATGAGACCCTCCTAGAC
AAATTCTACACTGAACTCTACCAGCAGCTGAATGACCTGGAAGCCTGTGTGATACAG
GGGGTGGGGTGACAGAGACTCCCCTGATGAAGGAGGACTCCATTCTGGCTGTGAGG
AAATACTTCCAAAGAATCACTCTCTATCTGAAAGAGAAGAAATACAGCCCTTGTGCC
TGGGAGGTTGTCAGAGCAGAAATCATGAGATCTTTTCTTTGTCAACAACTTGCAA
20 GAAAGTTTAAGAAGTAAGGAATGA, TGTGATCTGCCTCAAACCCACAGCCTGGGTA
GCAGGAGGACCTTGATGCTCCTGGCACAGATGAGGAGAATCTCTCTTTTCTCCTGCT
TGAAGGACAGACATGACTTTGGATTTCCTCCAGGAGGAGTTTGGCAACCAGTTCCAAA
AGGCTGAAACCATCCCTGTCCTCCATGAGATGATCCAGCAGATCTTCAATCTCTTCA
GCACAAAGGACTCATCTGCTGCTTGGGATGAGACCCTCCTAGACAAATTCTACACTG
25 AACTCTACCAGCAGCTGAATGACCTGGAAGCCTGTGTGATACAGGGGTGGGGTGA
CAGAGACTCCCCTGATGAAGGAGGACTCCATTCTGGCTGTGAGGAAATACTTCCAAA
GAATCACTCTCTATCTGAAGAGAGAAGAAATACAGCCCTTGTGCCTGGGAGGTTGTCA
GAGCAGAAATCATGAGATCTTTTCTTTGTCAACAACTTGCAAGAAAGTTTAAGAA
GTAAGGAATGA and fragments and derivatives thereof, said
30 fragments and derivatives coding for polypeptides displaying
an immunological or biological activity of IFN- α .

7. A DNA sequence selected from the group
consisting of DNA sequences of the formula: ATGGCCCTGTCC
TTTTCTTTACTGATGGCGTGCTGGTGCTCAGCTACAAATCCATCTGTTCTCTGGGC
35 TGTGATCTGCCTCAGACCCACAGCCTGGGTAATAGGAGGACCTTGATACTCCTGCAA
CAAATGGGAAGAATCTCTCATTCTCCTGCCTGAAGGACAGACATGATTTCCGATTC
CCCGAGGAGGAGTTTGATGGCCACCAGTTCCAGAAGACTCAAGCCATCTCTGTCTC

CATGAGATGATCCAGCAGACCTTCAATCTCTTCAGCAGAGGACTCATCTGCTGCT
TGGGAACAGAGCCTCCTAGAAAAATTTTCCACTGAACTTTACCAGCAACTGAATGAC
CTGGAAGCATGTGTGATACAGGAGGTTGGGGTGGGAAGAGACTCCCCTGATGAATGTG
GACTCCATCCTGGCTGTGAGGAAATACTTCCAAAGAATCACTCTTTATCTAACAGAG
5 AGAAGAAATACAGCCCTTGTGCCTGGGAGGTTGTAAAAAAGATTAAAGGAGGAAGGAT
TGA, TGTGATCTGCCTCAGACCCACAGCCTGGGTAATAGGAGGACCTTGATACTCC
TGCAAGAAATGGGAAGAATCTCTCATTTCTCOTGCCTGAAGGACAGACATGATTTCG
GATTCCCCGAGGAGGAGTTTGATGGCCACCACTTCCAGAAGACTCAAGCCATCTCTG
TCCTCCATGAGATGATCCAGCAGACCTTCAATCTCTTCAGCACAGAGGACTCATCTG
10 CTGCTTGGGAACAGAGCCTCCTAGAAAAATTTTCCACTGAACTTTACCAGCAACTGA
ATGACCTGGAAGCATGTGTGATACAGGAGGTTGGGGTGGGAAGAGACTCCCCTGATGA
ATCTGGACTCCATCCTGGCTGTGAGGAAATACTTCCAAAGAATCACTCTTTATCTAA
CAGAGAAGAAATACAGCCCTTGTGCCTGGGAGGTTGTCAGAGCAGAAATCATGAGAT
CCCTCTCGTTTTCAACAACTTGCAAAAAAGATTAAAGGAGGAAGGATTGA and
15 fragments and derivatives thereof, said fragments and
derivatives coding for polypeptides displaying an immunolog-
ical or biological activity of IFN- α .

8. A recombinant DNA molecule comprising a
DNA sequence said DNA sequence being selected from the
20 group consisting of DNA sequences according to claim 1,
2, 3, 4, 5, 6 or 7.

9. The recombinant DNA molecule according to
claim 8, wherein said DNA sequence is operatively linked
to an expression control sequence.

25 10. A recombinant DNA molecule according to
claim 9, wherein said expression control sequence is
selected from the group consisting of a lac system, a
 β -lac system, a trp system, major operator and promotor
regions of phage λ , the control region of fd coat protein,
30 and other sequences which control the expression of genes
of prokaryotic or eukaryotic cells and their viruses.

11. A recombinant DNA molecule according to
claim 9 or 10 selected from the group consisting of
C8-IFN- α 1, C8-IFN- α 2, LAC-AUG(α 2) and β -lac-AUG(α 2).

35 12. A host transformed with at least one
recombinant DNA molecule, said recombinant DNA molecule

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being selected from the group consisting of recombinant DNA molecules according to claim 8, 9, 10 or 11.

13. The host of claim 12 selected from the group consisting of strains of E. coli, Pseudomonas, Bacillus subtilis, Bacillus stearothermophilus, other bacilli, yeasts, other fungi, mouse or other animal or plant hosts and human tissue cells.

14. The transformed host according to claim 12 or 13 selected from the group consisting of E. coli HB101 (Z-pBR322(Pst)/HcIF-4c), E. coli HB101 (Z-pBR322(Pst)/HcIF-2h), E. coli HB101 (Z-pBR322(Pst)/HcIF-SN35), E. coli HB101 (Z-pBR322(Pst)/HcIF-SN42), and E. coli HB101 (Z-pKT287(Pst)/HcIF-2h-AH6).

15. The transformed host according to claim 12 or 13 selected from the group consisting of E. coli HB101 (Z-pBR322(Pst)/HcIF-II-206) and E. coli HB101 (Z-pBR322(Pst)/HcIF-SN35-AHL6).

16. The transformed host according to claim 12 or 13 selected from the group consisting of HchrIF-A, HchrIF-B, HchrIF-C, HchrIF-D, HchrIF-E, HchrIF-F, HchrIF-G, HchrIF-H, HchrIF-I, and HchrIF-J.

17. The transformed host according to claim 12 or 13 selected from the group consisting of E. coli DS410 (C8-IFN- α 1), E. coli DS410 (C8-IFN- α 2), E. coli DS410 (LAC-AUG(α 2)), E. coli DS410 HB101 (β lac-AUG(α 2)) and Mouse 3T3 (polynoma-Hif-chr35).

18. The transformed host according to claim 12 or 13 selected from the group consisting of HchrIF-K, HchrIF-L, HchrIF-M, HchrIF-N, HchrIF-O, HchrIF-P, HchrIF-Q and hosts transformed with Hif-chr19 and Hif-chr27.

19. A polypeptide or fragments and derivatives thereof displaying an immunological or biological activity of human leukocyte interferon produced by the transformed host, said transformed host being selected from the group consisting of the transformed hosts according to claim 12, 13, 14, 15, 16 or 17 or 18.

20. A polypeptide that it is coded for by a DNA sequence selected from the group consisting of DNA sequences according to claim 1, 2, 3, 4, 5, 6 or 7.

5 21. A polypeptide or fragments and derivatives thereof selected from the group consisting of IFN- α 1, IFN- α 2, IFN- α 4a and IFN- α 4b.

22. A polypeptide or fragments and derivatives thereof selected from the group consisting of polypeptides of the formula: METALASERPROPHEALALEULEUMETVALLEU
10 VALVALLEUSERCYSLYSSERSERCYSSERLEUGLYCYSASPLEUPROGLUTHRHIS
SERLEUASPNARGARGTHRLEUMETLEULEUALAGLNMETSERARGILESERPRO
SERSERCYSLEUMETASPARGHISASPPHEGLYPHEPROGLNGLUGLUPHEASPGLY
ASNGLNPHEGLNLYSALAPROALAILESERVALLEUHHISGLULEUILEGLNGLNILE
PHEASNLEUPHETHRTHRLYSASPSSERSERALAALATRPASPGLUASPLEULEUASP
15 LYPHECYSTHRLULEUTYRGLNGLNLEUASNASPLEUGLUALACYSVALMETGLN
GLUGLUARGVALGLYGLUTHRPROLEUMETASNALAASPSEIRILELEUALAVALLY
LYSTYRPHEARGARGILETHRLEUTYRLEUTHRGLULYSLYSTYRSERPROCYSALA
TRPGLUVALVALARGALAGLUIEMETARGSERLEUSERLEUSERTHRASNLEUGLN
GLUARGLEUARGARGLYSGLU, CYSASPLEUPROGLUTHRHISSEIRLEUASPN
20 ARGARGTHRLEUMETLEULEUALAGLNMETSERARGILESERPROSERSERCYSLEU
METASPARGHISASPPHEGLYPHEPROGLNGLUGLUPHEASPGLYASNGLNPHEGLN
LYSALAPROALAILESERVALLEUHHISGLULEUILEGLNGLNILEPHEASNLEUPHE
THRTHRLYSASPSSERSERALAALATRPASPGLUASPLEULEUASPLYSPHECYSTH
GLULEUTYRGLNGLNLEUASNASPLEUGLUALACYSVALMETGLNGLUGLUARGVAL
25 GLYGLUTHRPROLEUMETASNALAASPSEIRILELEUALAVALLYSLYSTYRPHEARG
ARGILETHRLEUTYRLEUTHRGLULYSLYSTYRSERPROCYSALATRPGLUVALVAL
ARGALAGLUIEMETARGSERLEUSERLEUSERTHRASNLEUGLNGLUARGLEUARG
ARGLYSGLU, and polypeptides from whatever source obtained
related to any of the foregoing polypeptides by mutation,
30 including single or multiple, base substitutions, deletions,
insertions and inversions of the DNA sequences which code
for them.

23. A polypeptide or fragments and derivatives thereof selected from the group consisting of polypeptides
35 of the formula: LeuLeuValAlaLeuLeuValLeuSerCysLysSerSer
CysSerValGlyCysAspLeuProGlnThrHisSerLeuGlySerArgArgThrLeu
MetLeuLeuAlaGlnMetArgArgIleSerLeuPheSerCysLeuLysAspArgHis

AspPheGlyPheProGlnGluGluPheGlyAsnGlnPheGlnLysAlaGluThrIle
ProValLeuHisGluMetIleGlnGlnIlePheAsnLeuPheSerThrLysAspSer
SerAlaAlaTrpAspGluThrLeuLeuAspLysPheTyrThrGluLeuTyrGlnGln
LeuAsnAspLeuGluAlaCysValIleGlnGlyValGlyValThrGluThrProLeu
5 MetLysGluAspSerIleLeuAlaValArgLysTyrPheGlnArgIleThrLeuTyr
LeuLysGluLysLysTyrSerProCysAlaTrpGluValValArgAlaGluIleMet
ArgSerPheSerLeuSerThrAsnLeuGlnGluSerLeuArgSerLysGlu, CysAsp
LeuProGlnThrHisSerLeuGlySerArgArgThrLeuMetLeuLeuAlaGlnMet
ArgArgIleSerLeuPheSerCysLeuLysAspArgHisAspPheGlyPheProGln
10 GluGluPheGlyAsnGlnPheGlnLysAlaGluThrIleProValLeuHisGluMet
IleGlnGlnIlePheAsnLeuPheSerThrLysAspSerSerAlaAlaTrpAspGlu
ThrLeuLeuAspLysPheTyrThrGluLeuTyrGlnGlnLeuAsnAspLeuGluAla
CysValIleGlnGlyValGlyValThrGluThrProLeuMetLysGluAspSerIle
LeuAlaValArgLysTyrPheGlnArgIleThrLeuTyrLeuLysGluLysLysTyr
15 SerProCysAlaTrpGluValValArgAlaGluIleMetArgSerPheSerLeuSer
ThrAsnLeuGlnGluSerLeuArgSerLysGlu, and polypeptides from
whatever source obtained related to any of the foregoing
polypeptides by mutation, including single or multiple,
base substitutions, deletions, insertions and inversions
20 of the DNA sequences which code for them.

24. A polypeptide or fragments and derivatives
thereof selected from the group consisting of polypeptides
of the formula: METALALEUSERPHERLEULEUMETALAVALLEUVAL
LEUSERTYRLYSSERILECYSSERLEUGLYCYSASPLEUPROGLNNTHRHISSER
25 LEUGLYASNARGARGTHRLEUILEULEUGLNGLNMETGLYARGILESERHISPHE
SERCYSLEULYSASPARGHISASPPHEGLYPHEPROGLUGLUGLUPHEASPGLYHIS
GLNPHEGLNLYSTHRGLNALAILESERVALLEUHSGLUMETILEGLNGLNTHRPHE
ASNLEUPHESERTHRGLUASPERSERALAALATRPGLUGLNSERLEULEUGLULYS
PHESERTHRGLULEUTYRGLNGLNLEUASNASPLEUGLUALACYSVALILEGLNGLU
30 VALGLYVALGLUGLUTHRPROLEUMETASNVALASPSERILELEUALAVALARGLYS
TYRPHEGLNARGILETHRLEUTYRLEUTHRGLULYSLYSTYRSERPROCYSALATRP
GLUVALVALARGALAGLUILEMETARGSERLEUSERPHERSERTHRASNLEUGLNLYS
ARGLEUARGARGLYSASP, CYSASPLEUPROGLNTHRHISERLEUGLYASNARGARG
THRLEUILEULEUGLNGLNMETGLYARGILESERHISPHESERCYSLEULYSASP
35 ARGHISASPPHEGLYPHEPROGLUGLUGLUPHEASPGLYHISGLNPHEGLNLYSTHR
GLNALAILESERVALLEUHSGLUMETILEGLNGLNTHRPHEASNSEUPHESERTHR
GLUASPERSERALAALATRPGLUGLNSERLEULEUGLULYSPHESERTHRGLULEU

TYRGLNGLNLEUASNASPLEUGLUALACYSVALILEGLNGLUVALGLYVALGLUGLU
THRPROLEUMETASNVALASPSERILELEUALAVALARGLYSTYRPHLEGLNARGILE
THRLEUTYRLEUTHRGLULYSLYSTYRSEPROCYSALATRPGLUVALVALARGALA
GLUILEMETARGSERLEUSERPHESETRHRASNLEUGLNLYSARGLEUARGARGLYSASP,

5 and polypeptides from whatever source obtained related to
any of the foregoing polypeptides by mutation, including
single or multiple, base substitutions, deletions, insertions
and inversions of the DNA sequences which code for them..

10 25. A method for producing a recombinant DNA
molecule comprising the step of introducing into a cloning
vehicle a DNA sequence, said DNA sequences being selected
from the group consisting of DNA sequences according to
claim 1, 2, 3, 4, 5, 6 or 7.

15 26. The method according to claim 25 comprising
the additional step of introducing into said cloning
vehicle an expression control sequence according to
claim 10, said expression control sequence being introduced
into said cloning vehicle so as to control and to regulate
the expression of said DNA sequence.

20 27. A method for transforming a host comprising
the step of introducing into a host a recombinant DNA
molecule, said recombinant DNA molecule being selected
from the group consisting of recombinant DNA molecules
according to claim 8, 9, 10 to 11.

25 28. A method for producing a polypeptide
displaying an immunological or biological activity of
human leukocyte interferon, comprising the steps of
transforming an appropriate host with a recombinant DNA
molecule according to claim 10 or 11; culturing said
30 host; and collecting said polypeptide.

29. The method according to claim 28, wherein
the host is selected from the group consisting of strains
of E. coli, Pseudomonas, Bacillus subtilis, Bacillus
stearothermophilus, other bacilli, yeasts, fungi, animal
35 or plant hosts, and human tissue cells.

30. A method for producing a polypeptide
displaying an immunological or biological activity of

human leukocyte interferon comprising the steps of culturing a host transformed by a recombinant DNA molecule according to claim 10 or 11 and collecting said polypeptide.

31. A process for selecting a DNA sequence
5 coding for a polypeptide displaying an immunological or biological activity of HuIFN α from a group of DNA sequences comprising the step of determining which of said DNA sequences hybridize to a DNA sequence, said DNA sequence being selected from the group consisting of DNA sequences
10 according to claim 1, 2, 3, 4, 5, 6 or 7.

32. The process of claim 31 wherein said DNA sequence screened is selected from the group consisting of DNA sequences from natural sources, synthetic DNA sequences, DNA sequences from recombinant DNA molecules
15 and DNA sequences which are a combination of any of the foregoing DNA sequences.

33. A composition for treating human viruses or treating human cancers or tumors which comprises at least one polypeptide selected from the group consisting
20 of a polypeptide, said polypeptide being selected from the group consisting of polypeptides according to claim 19, 20, 21, 22, 23 or 24.

34. A composition for treating bovine viral infections which comprises at least one polypeptide
25 selected from the group consisting of a polypeptide, said polypeptide being selected from the group consisting of polypeptides according to claim 19, 20, 21, 22, 23 or 24.

35. A method for treating human viruses or treating human cancers or tumors which comprises administering to said humans in a pharmaceutically acceptable
30 manner an effective amount of a composition according to claim 33.

36. A method for treating bovine viral infections which comprises administering to said animals in a
35 pharmaceutically acceptable manner an effective amount of a composition according to claim 34.

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